

PREGNANCY OUTCOME IN AMNIOTIC FLUID INDEX 5 CM OR LESS IN TERM PREGNANCY AT TERTIARY LEVEL TEACHING HOSPITAL, BIRGUNJ, NEPAL

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ABSTRACT

Introduction: Oligohydramnios has increased incidence of fetal distress, meconium-stained liquor, prolonged labor, low Apgar score, low birth weight, admission to neonatal intensive care unit, cord compression, birth asphyxia, and operative interference. The objective of the study was to determine the pregnancy outcome in amniotic fluid index 5 cm or less in term pregnancy.

Materials and Methods: This was a hospital-based cross-sectional study conducted at National Medical College & Teaching Hospital from June 2017 to May 2018. A total of 72 obstetric cases with amniotic fluid index (AFI) \leq 5 cm and 72 cases with AFI $>$ 5 cm with meeting the inclusion criteria were enrolled in the study after taking consent.

Results: Incidence of oligohydramnios was 2.2% out of 4318 deliveries and term oligohydramnios was 1.66%. AFI \leq 5 cm was associated with increased induction of labor ($p < 0.001$), caesarean section ($p = 0.01$), meconium stained liquor ($p = 0.106$), Apgar score $<$ 7 at 5 minutes ($p = 0.001$), NICU admission ($p = 0.003$), neonatal deaths ($p = 0.053$) were comparable with AFI $>$ 5 cm.

Conclusion: Amniotic fluid index \leq 5 cm at term is an indicator of poor perinatal outcome. Women with AFI \leq 5 cm can expect a good outcome if they have regular ANC visits and intrapartum monitoring than the AFI $>$ 5 cm.

Keywords: amniotic fluid index; oligohydramnios; perinatal outcome.

INTRODUCTION

Oligohydramnios is often accompanied by maternal and fetal conditions such as prolonged labor due to inertia, congenital anomalies, increased operative interference due to malpresentation, premature rupture of membranes (PROM) intrauterine growth restriction (IUGR), deformity due to intra amniotic adhesions, cord compression, abnormal heart rate, meconium stained amniotic fluid, post term pregnancy, birth asphyxia and low Apgar score.^{1,2} This study was carried out to determine the pregnancy outcome in amniotic fluid index 5 cm or less in term pregnancy.

Oligohydramnios is defined as the amniotic fluid is deficient in amount to the extent of less than 200 ml at term or sonographically amniotic fluid index (AFI) less than 5 cm.^{3,4} The semi quantitative method of calculating an AFI by using ultrasound to measure the sum of deepest pockets of amniotic fluid in the 4 quadrants of

the maternal abdomen is the most common method of quantifying amniotic fluid volume.⁵ The normal range of AFI is 5 – 24 cm.⁶

Oligohydramnios is found in 3-5 % of pregnancies in third trimester.⁷ Amniotic fluid is clear, slightly yellowish, protective liquid that surrounds the fetus during pregnancy.⁸ Amniotic fluid volume (AFV) measures about 50 ml at 12 weeks, 400 ml at 20 weeks and reaches peak of 1 litre at 36-38 weeks. Thereafter, the amount diminishes till at term it measures about 600-800 ml.⁹

METHODS AND MATERIALS

Study Design

This study was a hospital based cross-sectional study. The study was conducted at National Medical College & Teaching Hospital Birgunj, Nepal. This is a tertiary level hospital. The study period was twelve months from (1st

June, 2017 to 31st May, 2018). Ethical clearance was obtained from the Institutional Review Committee of National Medical College (No -NMC/209/074/075).

Method

Patients were grouped according to their AFI, study group with $AFI \leq 5$ cm, and control group with $AFI > 5$ cm. The hospital admission record was checked every day and the cases fulfilling the inclusion criteria were included in the study. The cases were monitored and followed up to the labor room till the postnatal ward. The fetal outcome were compared between the oligohydramnios and the control group; between the cases with $AFI \leq 5$ cm and AFI more than 5 cm. The participants who met inclusion criteria in the study period were enrolled.

Inclusion criteria – $AFI \leq 5$ cm (study group), $AFI > 5$ cm (control group), single live intrauterine pregnancy with vertex presentation, 37- 42 completed weeks of gestation, intact membrane and medical disorders. Exclusion criteria - Gestational age less than 37 weeks of pregnancy, gestational age more than 42 weeks, ruptured membranes, multiple gestation, congenital anomalies and antepartum haemorrhage.

Data was collected and noted on a structured proforma. On receiving a case, fulfilling the inclusion criteria, she was explained about the study in detail. She was assured of confidentiality and an informed written consent was taken. History and clinical examination was done. All baseline investigations (haemoglobin, random blood sugar, blood group, platelet, serology, urine routine, ultrasonography obstetric scan) were done and mode of delivery was then decided. Both the mother and the baby were followed up after delivery for the entire duration of the hospital stay. The patients enrolled in the study were divided into two groups based on the AFI; group A with $AFI \leq 5$ cm or less and group B with $AFI > 5$ cm. The determination of AFI was done by USG. Comparison was done between group A and group B. The criteria for the comparison includes demographic factor, mode of delivery, fetal well being and maternal complications. Regarding fetal outcome, details were noted in term of fetal weight, Apgar score at 5 minutes, any congenital anomalies, colour of liquor, admission in NICU and early neonatal death.

The data collected were entered daily. Analysis of the data was done by using SPSS software. The findings were then presented in the form of tables and P value was considered significant if $P < 0.05$. The final results were discussed and the conclusion was derived.

RESULTS

Table 1: Incidence of oligohydramnios

Incidence		
Cases	No.	Incidence
Total deliveries	4318	-
Total oligohydramnios	96	2.22%
Preterm oligohydramnios	24	0.55%
Term oligohydramnios	72	1.66%

The total number of deliveries during this one year period was 4318. Among them there were 96 oligohydramnios giving the incidence of oligohydramnios to be 2.2%. Out of these 72 were term oligohydramnios with incidence of term oligohydramnios being 1.66%. So, these 72 cases were analyzed as given above in Table 1.

Table 2 : Sociodemographic and Obstetric factors associated with oligohydramnios

Characteristics	Study group ($AFI \leq 5$)		Control group ($AFI > 5$)		P value
	No. of case (72)	%	No. of case (72)	%	
Age (years)					0.13
17 – 20	15	20.83	22	30.55	
21 – 25	33	45.83	32	44.44	
26 – 29	13	18.05	15	20.83	
>30	11	15.27	3	4.16	
Mean	24.36 ± 3.983		23.42 ± 3.520		
Parity	n = 72	%	n = 72	%	P value
Primigravida	34	47.22	39	54.16	
Multigravida	38	52.77	33	45.83	0.40
Gestational Age (weeks)	n = 72	%	n = 72	%	P value
37	17	23.61	8	11.11	
38	7	9.72	16	22.22	
39	18	25	21	29.16	
40	8	11.11	14	19.44	
41	13	18.05	7	9.72	
42	9	12.5	6	8.33	
Antenatal complications	n = 72	%	n = 72	%	P value
Mild preeclampsia	6	8.33	4	5.55	
Severe pre-eclampsia	4	5.55	5	6.94	
IUGR	1	1.38	-	-	
Prev. CS	6	8.33	10	13.88	
Rh Negative	1	1.38	-	-	
Severe anaemia	2	2.77	-	-	
Uncomplicated	52	73.23	51	70.83	0.18

AFI (cm)	n = 72	%	n = 72	%	P value
1	3	4.16	-	-	<0.001
2	13	18.05	-	-	
3	21	29.16	-	-	
4	22	30.55	-	-	
5	13	18.05	-	-	
>5	-	-	72	100	
Colour of Amniotic fluid	n = 72	%	n = 72	%	P value
Clear	28	38.88	36	50	0.106
Mild MSL	20	27.77	13	18.05	
Moderate MSL	15	20.83	8	11.1	
Thick MSL	9	12.5	15	20.83	
Labour	n = 72	%	n = 72	%	P value
Induced	45	62.5	14	19.44	<0.001
Spontaneous	27	37.5	58	80.55	
Mode of delivery	n = 72	%	n = 72	%	P value
Vaginal delivery	34	47.22	48	66.66	0.004
LSCS	36	50	16	22.22	
Instrument delivery	2	2.77	8	11.11	
Indications for LSCS	n = 36	%	n = 16	%	P value
Breech	1	2.77	2	12.5	0.01
CPD	2	5.55	2	12.5	
Fetal distress	15	41.66	8	50	
IUGR	1	2.77	1	6.25	
Prev. CS	4	11.11	1	6.25	
MSL	13	36.11	2	12.5	
Birth weights (kg)	n = 72	%	n = 72	%	P value
1.5 – 2	10	13.8	3	4.16	0.321
2.1 – 2.5	15	20.83	20	27.77	
2.6 – 3	34	47.22	35	48.61	
3.1 – 3.5	9	12.5	11	15.27	
> 3.5	3	4.16	3	4.16	
APGAR score less than 7	n = 56	%	n = 32	%	P value
1 minute	30	41.66	23	31.94	0.22
5 minute	26	36.11	9	12.5	0.001
NICU admission	n = 28	%	n = 12	%	P value
	28	38.88	12	16.66	0.003
Neonatal deaths	n = 6	%	n = 1	%	P value
	6	8.33	1	1.38	0.053

Most patients in this study belong to the age group of 21-25 years study (45.83%) and control (44.44%) as shown in Table 2. The mean age for study group was 24.36 ± 3.983 and that of control group was 23.42 ± 3.520 . There was no difference in the mean age between two groups statistically. $P = 0.13$ (not significant).

In study group, primigravida had 47.22% and multigravida 52.77% whereas in control group primigravida had 54.16% and multigravida 45.83%. $\chi^2 = 0.69$; $P = 0.40$ which shows study is not significant.

Most pregnancies in study group (25%) and control group (29.16%) were delivered by 39 completed weeks. In study group, incidence of mild preeclampsia 8.33%, severe preeclampsia 5.55% and previous LSCS was 8.33%. In control group, mild preeclampsia 5.55%, severe preeclampsia 6.94% and previous LSCS was 13.88%. Most pregnancies were uncomplicated in both study and control group. $P = 0.18$ (not significant).

The amniotic fluid index was measured by four quadrant amniotic fluid volume assessment technique. The mean AFI for study group was 3.40 ± 0.131 cm and AFI for control group was 9.35 ± 0.318 cm. $P < 0.001$ (significant). Liquor was clear in 50% of patients in control group as against 38.88% in study group. It was mild meconium stained in 27.77% of study group and 18% of control group. It was moderate meconium stained in 20.83% of study group and 11.1% of control group. It was thick meconium stained in 12.50% of study group and 20.8% of control group as shown in above Table 2. The difference was not found to be significant.

Labour occurred spontaneously in 37.5% of study group and 80.55% of control group. Labour was induced in 62.5% of study group and 19.44% of control group. $\chi^2 = 27.59$; $P = < 0.001$ (significant). This difference was found to be significant.

Majority of deliveries in study group were LSCS (50%) out of which elective LSCS was 11.11% and emergency LSCS was 38.88%, vaginal delivery 47.22%. In control group, vaginal delivery was 66.66% and LSCS was only 22.22%. $\chi^2 = 15.20$; $P = 0.004$ (significant). This difference was found to be significant.

Among study group (36 patients), the most common indication for LSCS was fetal distress (41.66%). In control group (16 patients), 50% of patients underwent LSCS for fetal distress. $\chi^2 = 18.17$; $P = 0.01$ (significant). This difference was found to be significant.

The mean birth weight for study group was $2.69 \text{ kg} \pm 0.065 \text{ kg}$ and for control group was $2.75 \text{ kg} \pm 0.068 \text{ kg}$. Among the study group 13.9% babies were $\leq 2 \text{ kg}$, whereas in control group only 4.2% babies were $\leq 2 \text{ kg}$.

$X^2 = 4.68$; $P = 0.321$ (not significant). This difference was not found to be significant.

The mean Apgar score less than 7 for study group $AFI \leq 5$ was 7.51 ± 0.170 at 5 minute. The mean Apgar score for women with $AFI > 5$ cm (control group) was 7.93 ± 0.159 at 5 minute. The 5 min Apgar < 7 was seen in 36.11% in study group and 12.5% in control group. The mean Apgar score was statistically significant and the difference in the occurrence of Apgar score < 7 among study and control group was also statistically significant.

NICU admission were 38.88% in study group, but only 16.66% of babies in control group were admitted in NICU as shown in Table 2. $X^2 = 8.862$; $P = 0.003$ (significant). This difference was found to be significant.

Neonatal death accounted for 8.33% of babies in study group and 1.38% of babies in control group. Neonatal deaths (5.55%) due to birth asphyxia and 2.77% due to meconium aspiration under observation in NICU. $X^2 = 3.754$; $P = 0.053$ (not significant). This difference was not found to be significant.

DISCUSSION

Oligohydramnios with $AFI \leq 5$ cm can lead to an increase in perinatal mortality and morbidity. In this study period of twelve months at National Medical College and Teaching Hospital, the incidence of oligohydramnios at term pregnancy has come out to be 1.66%. In another study done by Jun Zhang et al.¹⁰ the incidence of oligohydramnios was 1.5%, Lester Figueroa et al. (0.7%).¹¹ Oligohydramnios at NMCTH has been detected in greater number than before may be because of increasing awareness and literacy of the patients and better availability of health facility. The varied incidence of oligohydramnios could be due to varying prevalence of complications and diverse obstetric factors that influence the actual volume of amniotic fluid.

The antenatal assessment of AFI has led to increased diagnosis of oligohydramnios especially in suspected cases and PROM cases. This prior knowledge has helped in deciding the mode of delivery in an attempt to improve perinatal outcome. This has led to increase in LSCS rate of 50 % and vaginal delivery 45.83% in this study. High rates of LSCS of 70% and 56% were also seen in studies by Akhter et al.¹² and Pradhan et al. respectively in women with $AFI \leq 5$. Lei Hou et al.¹³ and Sarno et al. found that intrapartum oligohydramnios was associated with an increased risk of caesarean section indication mostly being fetal distress.¹⁴ Thus, the result of the present study were statistically comparable with other different studies.

Meconium stained liquor was noted in 44 cases (61.11%

; $P=0.003$) in our study. In a study by Nazlima et al. meconium stained liquor was noted in 30.76% of cases.¹⁵ Similarly meconium stained liquor was seen in 48% of women with oligohydramnios in the study done by Charu et al. in which 58% of women were induced.¹⁶ But in the study done by Casey et al.¹⁷ meconium was found only in 6% which is much lower than our study. However, there was no difference between the groups ($AFI \leq 5$ cm versus $AFI > 5$ cm) with regard to meconium stained amniotic fluid in the study of Voxman et al.¹⁸ This could be due to the inclusion of non stress test in the study in addition to AFI which helped in early detection of compromised fetus.

Most studies show that oligohydramnios has high chance of being associated with low APGAR. In this study, the mean Apgar score less than 7 for study group $AFI \leq 5$ was 7.51 ± 0.170 and 36.11% babies having an APGAR score < 7 at 5 minute. The slightly better outcome may be due to the offering of LSCS to the patient in most cases with $AFI \leq 5$ and the study sample being term pregnancy. Chauhan et al.¹⁹ in review of 18 reports on amniotic fluid index published between 1987 and 1997 concluded that AFI of 5 cm or less significantly increases the risk of either LSCS for fetal distress or low 5 min APGAR score (< 7). This is explained by the inclusion of both antepartum and intrapartum cases of oligohydramnios in their study.

The mean birth weight for study group was $2.69 \text{ kg} \pm 0.065 \text{ kg}$ and for control group was $2.75 \text{ kg} \pm 0.068 \text{ kg}$. The study by Locatelli et al.²⁰ where neonates with birth weight $< 2.5 \text{ kg}$ (13.2% vs. 5.5%, $p<0.001$) were significantly higher in the $AFI \leq 5$ cm group compared to the $AFI > 5$ cm. Another study by Akhter et al.¹² showed 30% IUGR in $AFI < 5$ cm in contrary to 10% patient in $AFI > 5$ cm. Preshit Chate et al.²¹ found an increased rate of low birth weight babies among the cases. Due to the hospital protocol of twenty four hours observation after caesarean section NICU admission were present in several cases but there were no significant morbidity associated with it. Twenty eight out of 72 babies (38.88% ; $P=0.003$) needed neonatal admission in this study. Incidence of NICU admission was also consistent with studies done by Magann et al.²² and Casey et al. ¹⁷ which were 7.6% and 7% respectively. The incidence of NICU admission was found to be 18.5% by Garmel et al.²³ Chandra P et al.²⁴ in their study had 46.15 % neonatal admission rate in comparison to Sriya R et al.²⁵ which was 88.88 %. Higher rate of neonatal admission in their study may be due to the increased association with IUGR babies in comparison to this study.

There were 6 early neonatal death out of 72 cases (8.33% $P=0.053$) in this study. The low mortality of babies in this study could reflect the immediate intervention by LSCS in most of the cases in our study. Perinatal mortality

rate in cases of oligohydramnios was 87.7% in the study done by Chhabra et al.²⁶ The high rate of mortality in this study may be because of the inclusion of preterm oligohydramnios cases from 28 weeks of gestation and increased association of congenitally anomalous babies (4.15%) which was unlike our study in which there were no anomalous babies. In other studies by Bangal et al.²⁷ and Casey et al.¹⁷ the perinatal mortality was 24% and 5% respectively. Therefore, it is noted that the risk of mortality is higher where earlier gestational cases were included and anomalies babies and growth retardation was more prevalent.

Oligohydramnios has been associated with various maternal complications. In this study oligohydramnios was mainly due to postdated pregnancy i.e. in 24 cases (33.33% cases), mild pre eclampsia 8.33%, severe pre eclampsia 5.55% and previous LSCS was 8.33%. Its diagnosis is also increasing because of the increasing tendency to do an ultrasound. The reason behind this was to identify the oligohydramnios so that early intervention could be taken especially if severely oligohydramnios and vaginal delivery could be allowed if the liquor was still adequate. Jagatia et al. found that the cause of oligohydramnios was idiopathic in 52% cases followed by pregnancy induced hypertension in 23% of the cases. In this study no obvious cause for oligohydramnios was noted in 16.3% cases.²⁸ Chhabra et al. in his study included cases from 28 weeks and found congenital malformation rate to be 4.15%.²⁶ The study was not significant.

Due to the limited duration and number of samples, the projected result cannot be conclusively applied to large populations, so multicentric study is recommended.

CONCLUSION

The present study showed that AFI \leq 5cm is associated with various maternal and fetal outcome comparative to AFI $>$ 5 cm. From this study, we concluded that oligohydramnios is a high risk pregnancy and proper antepartum care, intensive fetal surveillance and intrapartum care are required in patient with oligohydramnios. Every case of oligohydramnios needs careful antenatal evaluation, parental counseling, individualization, decisions regarding time and mode of delivery. Continuous intrapartum fetal monitoring and good neonatal care are necessary for better perinatal outcome.

REFERENCES

1. McCurdy CM, Jr., Seeds JW. Oligohydramnios: problems and treatment. *Semin Perinatol.* 1993;17(3):183-96. [PubMed]
2. Hill LM, Breckle R, Wolfgram KR, O'Brien PC. Oligohydramnios: ultrasonically detected incidence and subsequent fetal outcome. *Am J Obstet Gynecol.* 1983;147(4):407-10. [DOI]
3. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The four-quadrant assessment of amniotic fluid volume: an adjunct to antepartum fetal heart rate testing. *Obstet Gynecol.* 1987;70(3 Pt 1):353-6. [PubMed]
4. Moore TR. Superiority of the four-quadrant sum over the single-deepest-pocket technique in ultrasonographic identification of abnormal amniotic fluid volumes. *Am J Obstet Gynecol.* 1990;163(3):762-7. [DOI]
5. Cunningham FG MP, Leveno KJ, Gant NF, Gilstrap LC. Disease and abnormalities of fetal membrane. In :Cunningham, FG, MacDonalds Pc, Leveno KJ, Gant NF, Gilstrap LC, editors. *Williams obstetrics.* 19 th ed. Norwalk, CT: Appleton and Lang. 1993: p733-40.
6. Manning FA. *General principles and applications of ultrasonography.* 2004. 315-56 p.
7. Gramellini D, Fieni S, Verrotti C, Piantelli G, Cavallotti D, Vadora E. Ultrasound evaluation of amniotic fluid volume: methods and clinical accuracy. *Acta Biomed.* 2004;75 Suppl 1:40-4. [PubMed]
8. Underwood MA, Gilbert WM, Sherman MP. Amniotic fluid: not just fetal urine anymore. *J Perinatol.* 2005;25(5):341-8. [DOI]
9. Dutta DC. *Textbook of Obstetrics,* 8th edition; 2015:43-44;250-251.
10. Zhang J, Troendle J, Meikle S, Klebanoff MA, Rayburn WF. Isolated oligohydramnios is not associated with adverse perinatal outcomes. *BJOG.* 2004;111(3):220-5. [DOI]
11. Figueroa L, McClure EM, Swanson J, Nathan R, Garces AL, Moore JL, et al. Oligohydramnios: a prospective study of fetal, neonatal and maternal outcomes in low-middle income countries. *Reprod Health.* 2020;17(1):19. [DOI]
12. Akhter H GK, Daisy KP Amniotic Fluid Index in High Risk Pregnancies and Pregnancy Outcome. *Dinajpur Med Col J.* 2010;3:1-5.
13. Hou L, Wang X, Hellerstein S, Zou L, Ruan Y, Zhang W. Delivery mode and perinatal outcomes after diagnosis of oligohydramnios at term in China. *J Matern Fetal Neonatal Med.* 2020;33(14):2408-14. [DOI]
14. Sarno AP, Jr., Ahn MO, Phelan JP. Intrapartum amniotic fluid volume at term. Association of ruptured

- membranes, oligohydramnios and increased fetal risk. *J Reprod Med.* 1990;35(7):719-23.
15. Nazlima N, Fatima B. Oligohydramnios at third trimester and perinatal outcome. *Bangladesh J. Medical Sci.* 2012;11(1):4. [DOI]
16. Jandial C, Gupta S, Sharma S, Gupta M. Perinatal outcome after antepartum diagnosis of oligohydramnios at or beyond 34 weeks of gestation. *JK Sci.* 2007;9(4):213-4. [Full text]
17. Casey BM, McIntire DD, Bloom SL, Lucas MJ, Santos R, Twickler DM, et al. Pregnancy outcomes after antepartum diagnosis of oligohydramnios at or beyond 34 weeks' gestation. *Am J Obstet Gynecol.* 2000;182(4):909-12. [DOI]
18. Voxman EG, Tran S, Wing DA. Low amniotic fluid index as a predictor of adverse perinatal outcome. *J Perinatol.* 2002;22(4):282-5. [DOI]
19. Chauhan SP, Sanderson M, Hendrix NW, Magann EF, Devoe LD. Perinatal outcome and amniotic fluid index in the antepartum and intrapartum periods: A meta-analysis. *Am J Obstet Gynecol.* 1999;181(6):1473-8. [DOI]
20. Locatelli A, Vergani P, Toso L, Verderio M, Pezzullo JC, Ghidini A. Perinatal outcome associated with oligohydramnios in uncomplicated term pregnancies. *Arch Gynecol Obstet.* 2004 Jan;269(2):130-3. [DOI]
21. Chate P, Khatri M, Hariharan C. Pregnancy outcome after diagnosis of oligohydramnios at term. 2016. 2016;2(1):4. [DOI]
22. Magann EF, Chauhan SP, Kinsella MJ, McNamara MF, Whitworth NS, Morrison JC. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. *Am J Obstet Gynecol.* 1999;180(6 Pt 1):1330-6. [DOI]
23. Garmel SH, Chelmow D, Sha SJ, Roan JT, D'Alton ME. Oligohydramnios and the appropriately grown fetus. *Am J Perinatol.* 1997;14(6):359-63. [DOI]
24. Chandra PC, Schiavello HJ, Lewandowski MA. Effect of oral and intravenous hydration on oligohydramnios. *J Reprod Med.* 2000;45(4):337-40.
25. Sriya R SS. Perinatal outcome in patients with amniotic fluid index ≤ 5 cm. *J Obstet Gynaecol India* 2001;51:98-100.
26. Chhabra S, Dargan R, Bawaskar R. Oligohydramnios: a potential marker for serious obstetric complications. *J Obstet Gynaecol.* 2007;27(7):680-3. [DOI]
27. Vidyadhar B. Bangal PAG, Bhushan M. Sali. Incidence of oligohydramnios during pregnancy and its effects on maternal and perinatal outcome. *J Pharmaceut Biomed Sci.* 2011;12(12):1-4.
28. Jagatia K SN, Patel S. . Maternal and fetal outcome in oligohydramnios-Study of 100 cases. *Int J Med Sci Public Health.* 2013;2(3):724-7. [DOI]